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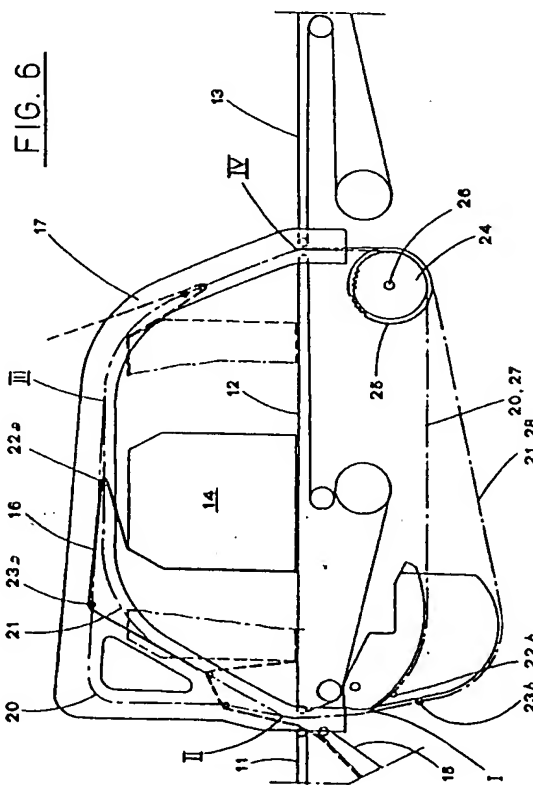
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(54) Method and apparatus for wrapping articles.

(57) A method for setting pieces (16) of wrapping material, in a machine for wrapping articles (14) with pieces (16) of wrapping material, during the wrapping phase of the article (14) includes transporting each single wrapping material piece (16) by means of a plurality of support bar means (22a, 23a) which are disposed set apart with reference to the transport direction, and cooperating with each other (24, 25, 26).

An apparatus for carrying about this method includes a plurality of closed loop transport means (20, 21), at least one wrapping bar (22, 23) associated to each one of the above mentioned transport means (20, 21), driving means (24, 25), designed to drive, in proper connection, the transport means (20, 21).



EP 0 629 551 A1

The present invention has, as a subject, a method and an apparatus for transporting a piece of wrapping material during the article wrapping phase in a machine for wrapping articles with pieces of wrapping material, particularly heat-shrinkable material.

Presently, as described in the patents US-A-3.791.100, US-A-5.203.144 and US-A-5.203.146, these last two patents being owned by the applicant of this patent application, the above mentioned wrapping machine generally and basically comprises:

- a first conveyor, designed for supporting the articles to be wrapped and to feed them one by one to a second conveyor;
- a second wrapping phase conveyor having an inlet end, an outlet end, and an upper surface situated between the above mentioned inlet and outlet ends, this upper surface being aimed at supporting and conveying articles while being wrap packaged in succession;
- means for feeding the wrapping material, designed to feed single pieces of wrapping material, in succession, to the above mentioned wrapping phase conveyor, placing the lead extremity of each wrapping material piece on top of the upper surface of the above mentioned wrapping phase conveyor, at the inlet end thereof;
- wrapping means comprising an endless conveyor carrying at least one wrapping bar along a path surrounding the above mentioned wrapping phase conveyor, these wrapping means being designed to set the above mentioned heat-shrinkable wrapping material pieces over and in front of each article being wrapped, then placing the rear extremity of the above mentioned wrapping material piece in a region between the above mentioned wrapping phase conveyor and the upstream end of a third receiving conveyor;
- a third receiving conveyor, for receiving and supporting the articles partially wrapped, aimed at placing the rear extremity of the wrapping material piece under the lead extremity of the same wrapping material piece;
- synchronising means, designed to set in proper time relation the motion of the above mentioned first conveyor, the motion of the above mentioned second conveyor, said means for feeding the wrapping material, said endless transport means and the related wrapping bar, and the motion of the above mentioned third receiving conveyor.

These machines, made as explained hitherto, are affected by several drawbacks as far as the transport of the wrapping material piece is concerned, as performed by the wrapping bar endless transport means.

These drawbacks affect negatively the production rate, as well as the correct and harmonious set-

tlement of the wrapping material piece.

With reference to figures 1, 2, 3, 3a and 3b of the drawings attached hereto, which show subsequent sequences concerning the main operative stages in which an article is wrapped while being made to advance, in accordance with the known method as described hereinabove, reference numeral 1 indicates the article feeding conveyor, reference numeral 2 indicates the conveyor along which the wrapping of the articles is performed while reference numeral 3 indicates the wrapped article receiving conveyor.

Reference numeral 4 indicates endless transport means which carry, for instance, two wrapping bars indicated by 5a and 5b.

The wrapping material feeding means are referred to as 6, while the wrapping material pieces are indicated by the numerals 7a and 7b.

The articles to be wrap packaged are referred to as 8a and 8b.

Referring now to Figure 1, an article 8a to be wrap packaged, is being transferred from the conveyor 1 to the conveyor 2.

In the meanwhile the wrapping material piece 7a is fed by the conveyor 6, which places the leading edge of the same wrapping material piece between the bottom of the article 8 and the conveyor 2.

Referring now to figure 2, the whole article is placed on the conveyor 2 with the leading part of the wrapping material piece situated between the bottom of the article 8a and the transport surface of the conveyor 2, while the wrapping bar 5a, suitably synchronised, intercepts the wrapping material piece 7a in its intermediate region.

Referring to figure 3, the wrapping bar 5a has begun the transport of wrapping material piece 7a so that to set the same around the article.

Referring to figure 3a, the article 8a is moved forward and the transfer of the subsequent article 8b from the conveyor 1 to the conveyor 2 can take place only when the rear extremity of the wrapping material piece 7a is beyond the inlet end of the conveyor 2, so that the leading end of the said subsequent article 8b does not push the rear extremity of the wrapping material piece 7a against the conveyor 2, thus preventing a correct flowing of the wrapping material piece 7a pulled by the bar 5a.

For this reason, the distance between the precedent package 8a and the subsequent package 8b must be in relation with the length of the wrapping material piece.

This distance determines the feeding step of the articles 8a, 8b, etc., defining the production capacity of the wrapping machine.

Referring now to fig 3b, it is noted that, during setting of the wrapping material piece 7a by the bar 5a, the part of the same wrapping material piece 7a being at the back of the bar 5a touches the part of the wrapping material piece 7a being before the same bar 5a,

thus provoking adherence of the two contacting surfaces.

This adherence, in its turn, brings about undesired creeping effects resulting principally from the feature of the same wrapping material to charge electrostatically.

In particular environment situations, such effects could not allow for the correct spreading of the wrapping material piece thus making it impossible to use the machine with particular types of wrapping material or with particular lengths of the wrapping material pieces.

The recent embodiment, illustrated in figures 4 and 4a, provides for early withdrawing of the rear part of wrapping material piece 7a, so that the step between the articles may be reduced in order to increase the productive capacity of the wrapping machine.

The substantial difference between the two embodiments lies in the fact that the close loop path in the endless transport means has the upper path considerably higher than the top of the article to be wrapped.

Such embodiment presents many drawbacks, the first of which results from the fact that during the phases of wrapping the article, the part of wrapping material piece comprised between the wrapping bar 5a and the top of the article, due to its forward advancement, fills with air and swells, causing a longitudinal tension that sometimes can withdraw the lead extremity of the wrapping material piece from under the article, specially with articles of limited weight.

Another drawback of the above mentioned embodiment, results from the fact that the wrapping bar must be moved much quicker because of its longer path, thus the aforementioned swelling effect is increased and a correct and harmonious spreading of the wrapping material piece may be obstructed.

A further disadvantage of such embodiment that prevents a correct spreading of the wrapping material piece around the article 8a is due to the long distance of the wrapping bar 5a from the surface of the article to be wrapped.

The last drawback, already pointed out in the previous embodiment, with reference to figure 4a, results from the fact that the part of the wrapping material piece 7a that is behind the wrapping bar 5a touches the part of the wrapping material piece 7a that is before the wrapping bar 5a causing the same undesired effects, already described in the first embodiment.

The main object of the present invention is therefore to avoid the drawbacks reported above.

The invention, such as characterised by the claims, resolves the problem of finding out a method and producing apparatus for transport of the wrapping material piece during the wrapping phase of articles in a machine for wrapping articles with wrapping

material pieces.

The following results are obtained by the use of a method and an apparatus of this type:

- the rear extremity of the wrapping material piece is withdrawn earlier from the upstream end of the conveyor thus freeing earlier the zone between the feeding conveyor and the wrapping conveyor;
- the part of the wrapping material piece behind the wrapping bar does not touch the part before the wrapping bar;
- the wrapping bar can move close to the surfaces to be wrapped;
- the speed of wrapping bar is a bit higher than the advancement speed of the article to be wrapped.

The first advantage of the present invention is that the articles to be wrapped can be positioned closer one to another, thus reducing the step, since the rear of the wrapping material piece is withdrawn earlier from between the feeding and wrapping conveyors, and the machine productive capacity increases.

Another advantage of the present invention is a better spreading of the wrapping material piece around the article in the phase of wrapping of the latter and the possibility to use the above mentioned machine in any environmental conditions and/or with any type of wrapping material and/or any length of wrapping material piece, since damaging effects resulting from a wrapping bar that is far from the surfaces to wrap and/or effects resulting from adherence of the wrapping material pieces one to another are avoided.

Further characteristics and advantages of the present invention will be better pointed out in the following detailed description of the preferred embodiment, given here as a mere example, not limitative, with reference to the enclosed drawings, in which:

- Figure 5 is a perspective view of the apparatus being the subject of the present invention, incorporated in a section of the wrapping machine, designed to wrap the articles;
- Figure 6 is a schematic lateral view of the apparatus, in which the current operative phase is shown with continuous line and the precedent and subsequent phases are drafted with dotted line;
- Figures from 7 to 13 show a schematic view of some operative phases of the wrapping of an article.

With reference to the accompanying figures, in particular to figures 5 and 6, the wrapping machine is constituted by a base 10 that carries a first conveyor 11 designed to support and feed, in single sequence, articles 14 to a second conveyor 12 on which the same articles are wrapped; and by a third conveyor 13 that receives the articles from the second conveyor 12 and that complete the wrapping thereof.

Below said machine there is a conveyor 15 designed to feed, in single sequence, wrapping material pieces 16, putting their leading end over the upstream end of the second conveyor 12.

Astride of the second conveyor 12, and near to it, there is a frame 17 including two uprights 17a, 17b, arranged in a mirror-like manner on the sides of the conveyor 2 and extending therealong.

Each upright 17a, 17b, e.g. 17b defines a pair of sliding guides 18b, 19b, destined to guide respective chains 20b, 21b, each of which transports one end of respective plurality of wrapping bars 22a, 22b and 23a, 23b, only two of them being present in the indicated example.

The other end of the bars 22a, 22b and 23a, 23b is supported by the chains 20a, 21a, guided slidingly in respective guides 18a, 19a, defined by the upright 17a.

Said chains 20a-21a, 20b-21b are moved by respective chain supporting wheels 24a-25a and 24b-25b that are keyed on a common driving shaft 26.

Thus, the bars 22-23 of each pair of bars 22a-23a, 22b-23b are transported together.

Arranged in the way shown in figure 6, the bars 22 describe a first orbit 27, contained in a vertical plane circumscribing the conveyor 12; while the bars 23 describe a second longer orbit 28, contained in a vertical plane preferably parallel to the previous one, and circumscribing the conveyor 12.

Still with reference to figure 6, said orbits 27 and 28 have a path I-II coincident, a path II-III first divergent and then convergent, a path III-IV coincident, and a path IV-I first divergent and then convergent; this causes the change of the relative distance between the single bars 22, 23 during circulation of each pair of bars 22a-23a, 22b-23b.

Such changeable relative distance is obtained by making the orbital path 27 shorter than the orbital path 28, and, simultaneously, the pitch line of the driving wheel 24 shorter than the one of the wheel 25, and making both wheels 24 and 25 rotate with the same angular speed in order to compensate the difference of the path of the chains 20, 21.

With such arrangement, it is possible to change relative distance between the reciprocal bars 22, 23 of each pair of bars 22a-23a, 22b-23b by shifting one of them in respect to the other; it is also possible to change the orbital speed of the pair of bars 22a-23a, 22b-23b or the speed of a single bar in respect to the other, providing for replacement of one or both driving wheels with others of different pitch line.

The wrapping machine is also equipped with a kinematic mechanism (not shown because it is not part of the subject of the present invention) such that it synchronises the movements of the three conveyors 11, 12, 13, of the carrier 15, and of the shaft 26 so as to obtain a synchronisation for the proceeding articles 14, for the wrapping material pieces 16 being fed and

for the pair of wrapping bars 22, 23.

With reference to the figures from 7 to 13, that illustrate subsequent sequences concerning the principal operative phases of the wrapping of an article during its proceeding, the wrapping machine feeds the articles 14a, 14b to the conveyor 12 by the conveyor 11 in a sequence.

As shown in figure 7, an article 14a is situated over the two conveyors 11 and 12, and the leading extremity of a wrapping material piece 16a is so placed as to result interposed between the bottom of the same article 14a and the transport surface of the conveyor 12.

As shown in figure 8, the leading extremity of the wrapping material piece 16a is interposed between the bottom of the article 14a and the transport surface of the conveyor 12; when the whole article 14a is on the conveyor 12, the wrapping bar 22a comes in contact with the wrapping material piece being fed, while the bar 23a remains slightly back.

As shown in figure 9, the bar 22a is spreading the wrapping material piece 16a on the back facing of the article.

The bar 23a, also interposed between the two conveyors 11 and 12, has come in contact with and raised the wrapping material piece.

A subsequent article 14b is situated on the conveyor 11 behind the article 14a and is moved towards the conveyor 12 by the same conveyor 11.

With reference to figure 10, the rear extremity of the wrapping material piece 16a is already over the level of the conveyors 11 and 12, thus freeing this zone for the feeding of the subsequent article 14b.

Comparing this arrangement with the one illustrated in figure 3a, relative to the known technique, it appears that the new arrangement increases the portion of the wrapping material piece that is withdrawn, thus allowing for the reduction of the space between the articles to be wrapped; in comparison with figure 4, also related to the known technique, it appears that the wrapping bar moves close to the facings of the article, improving the spreading of the wrapping material piece thereon.

With reference to figure 11, the wrapping material piece 16a is carried and transported by the bars 22a, 23a that define its linear segmented configuration.

In comparison with the conformation illustrated in figure 3b, the segmented conformation of the figure 11 prevents the contact or overlapping of the parts of the wrapping material piece behind and before the bar 22, thus eliminating the undesired effects reported earlier; while, comparing with the figure 4a, also illustrating the known technique, the wrapping bar appears to be close to the upper facing of the article, avoiding the disadvantages reported earlier.

With reference to figure 12, the bar 22a, together with the bar 23a, has partially wrapped the article 14a and has made the rear extremity of the wrapping ma-

terial piece 16a to pass between the conveyors 12 and 13, then positioning it below the transport surface of the same.

The subsequent article 14b is placed on the conveyors 11 and 12, the leading extremity of a subsequent wrapping material piece 16b is situated below the bottom of the same article and the transport surface of the conveyor 12; a subsequent pair of wrapping bars 22b, 23b, moving in phase relation with the same article 14b that is now proceeding as well as with the wrapping material piece 16b being fed, are going in contact with the wrapping material piece; the conditions illustrated in figure 7 relative to the article 14a, are thus repeated and the operating cycle may take place again.

With reference to figure 13, the article 14a is being transported from the conveyor 12 to the conveyor 13 and in said passage the rear extremity of the wrapping material piece 16a is placed below the leading extremity of the same wrapping material piece 16a, thus completing the wrapping of the same article 14a.

The article 14b proceeds and, as for the precedent article, the leading extremity of a subsequent wrapping material piece 16b has been interposed between the bottom of the article and the transport surface of the conveyor 12.

The description of the method and the device made with reference to the enclosed figures of drawings are given as a pure example, not limitative and therefore it is evident that all changes or variants suggested by use or practice are anyway included within the scope of the following claims.

## Claims

1. Method for setting a piece of wrapping material around an article during the article wrapping phase in a wrapping machine for wrapping articles with pieces of wrapping material comprising:

- a wrapping conveyor (12) having an inlet end, outlet end and an upper surface between said two ends for carrying and conveying subsequent articles (14) to be wrapped;
- conveying means (15) designed to supply the wrapping material for feeding, in single sequence, said wrapping conveyor (12) with wrapping material pieces (16) placing the leading extremity of the same over the upper surface of said wrapping conveyor in correspondence with its inlet end;
- wrapping means (20, 21) carrying wrapping bars (22, 23) along a path surrounding said wrapping conveyor (12) designed to wrap an article (14), placed on said conveyor, with a single wrapping material piece (16); characterised in that it transports every single wrapping material piece (16) by means of a

plurality of supporting points (22, 23) set spaced apart from each other in the transport direction and linked to one another.

2. Method, according to claim 1, characterised in that the distance between said supporting points (22, 23) changes during the transport phase of the single wrapping material piece (16).

3. Method, according to claim 1, characterised in that said distance between the supporting points (22, 23) is minimal at the starting point of the wrapping material piece (16) transport, then increases rapidly during the phase of withdrawal of the wrapping material piece (16) and reduces in the final phase of transport.

4. Method, according to claim 2 or 3, characterised in that said single supporting points (22, 23) define respective close loop orbits (27, 28) having different lengths.

5. Method, according to claim 4, characterised in that said single supporting points move with different speeds.

6. Apparatus for setting a wrapping material pieces around an article during the article wrapping phase in a wrapping machine for wrapping articles with pieces of wrapping material, comprising:

- a conveyor (12) along which the wrapping takes place, having an inlet end, an outlet end, and an upper surface between said two ends designed to support and convey subsequent articles (14) to be wrapped;
- conveying means (15) designed to supply the wrapping material for feeding, in single sequence, said wrapping conveyor (12) with wrapping material pieces (16) placing the leading extremity of the same over the upper surface of said wrapping conveyor in correspondence with its inlet end;
- wrapping means (20, 21) carrying wrapping bars (22, 23) along a path surrounding said wrapping conveyor (12) designed to wrap an article (14), placed on said conveyor, with a single wrapping material piece (16); characterised in that said wrapping means comprise:
- a plurality of closed loop conveying means (29, 21);
- at least one wrapping element (22, 23) carried by each of the above mentioned conveying means (20, 21);
- driving means (24, 25) designed to drive and correlate the movement of said conveying means (20, 21).

7) Apparatus, according to claim 6, characterised in that said conveying means comprise:

- a first pair of counterfaced conveying chains (20a, 20b);
- a second pair of counterfaced conveying chains (21a, 21b);
- a frame (17) having two opposite uprights

(17a, 17b) each of which defines two sliding guides (18a, 19a; 18b, 19b) for each respective chain (20a, 21a, 20b, 21b);

8) Apparatus, according to claim 7, characterised in that the two sliding guides (18a, 19a, 18b, 19b) in each frame (17a, 17b) have separate and common path portions.

9) Apparatus, according to claim 6, characterised in that said operating means comprise a double pair of toothed wheels (24a, 25a, 24b, 25b) keyed onto a common shaft (26) and engaging said double pair of chains (20a, 21a; 20b, 21b).

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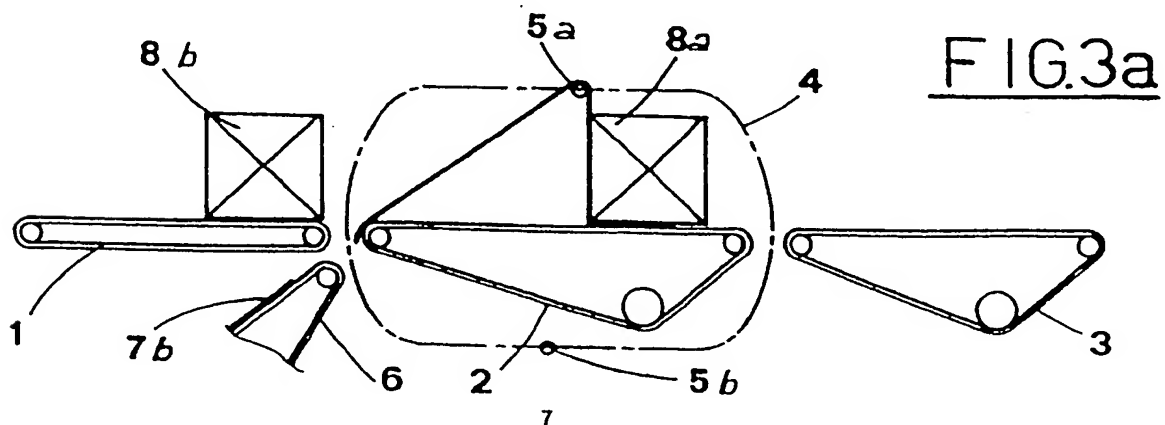
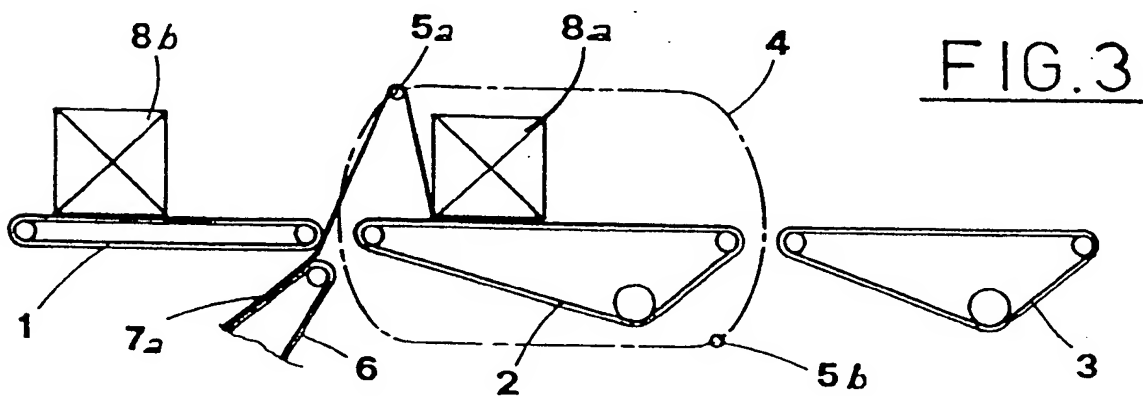
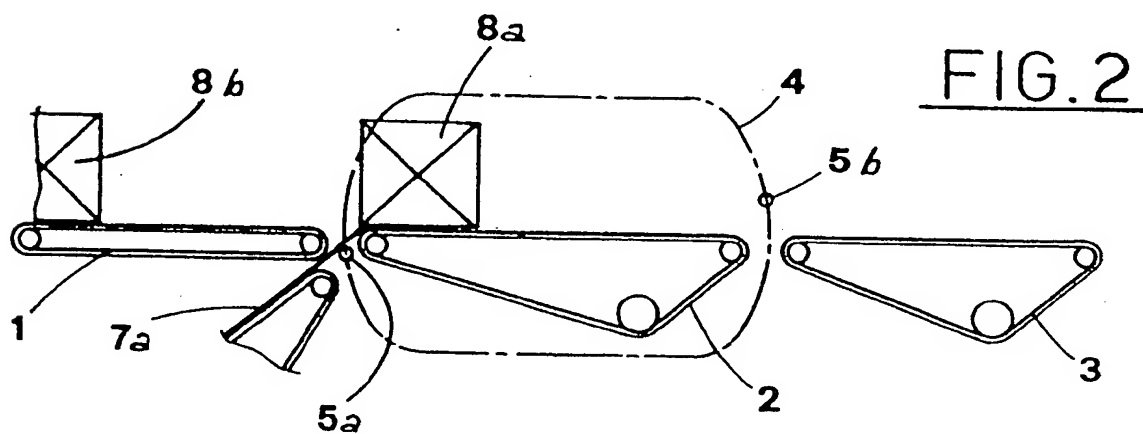
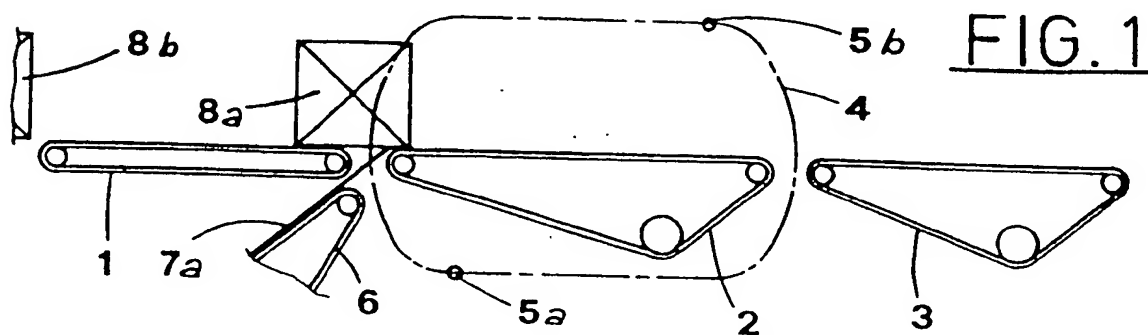
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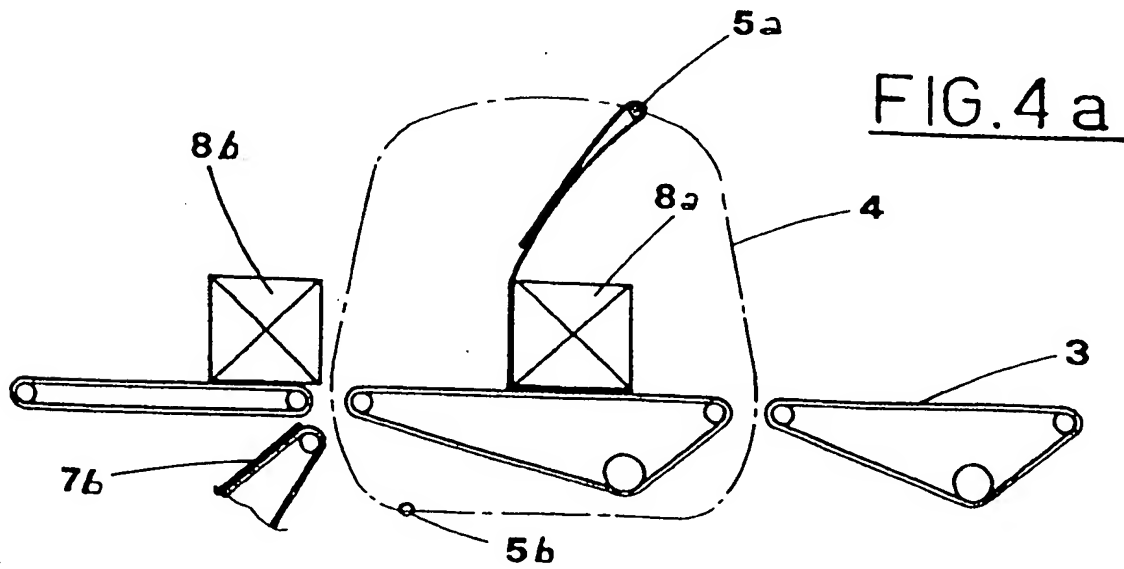
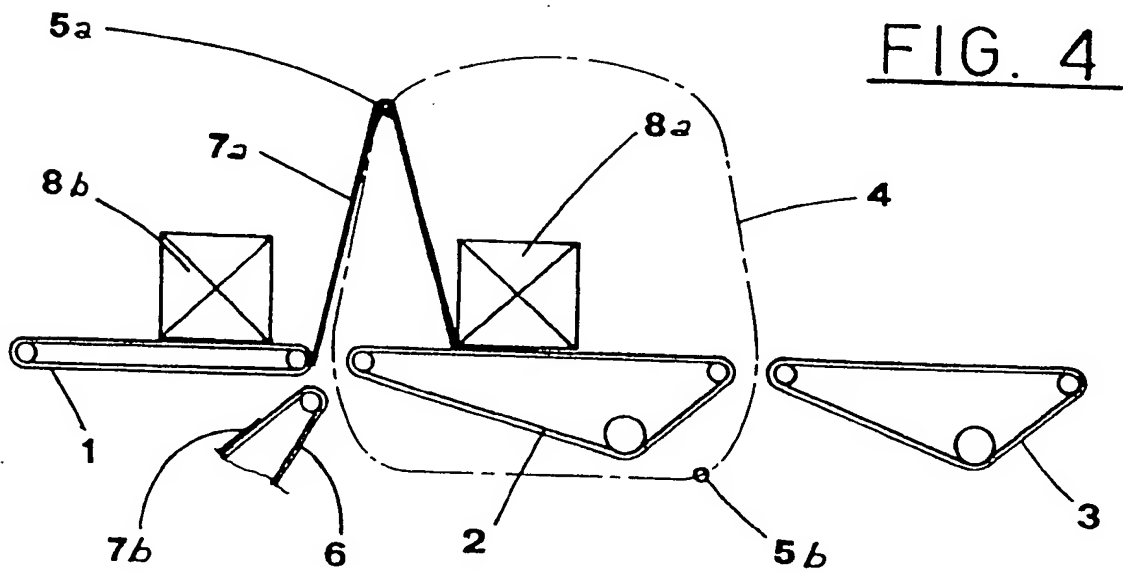
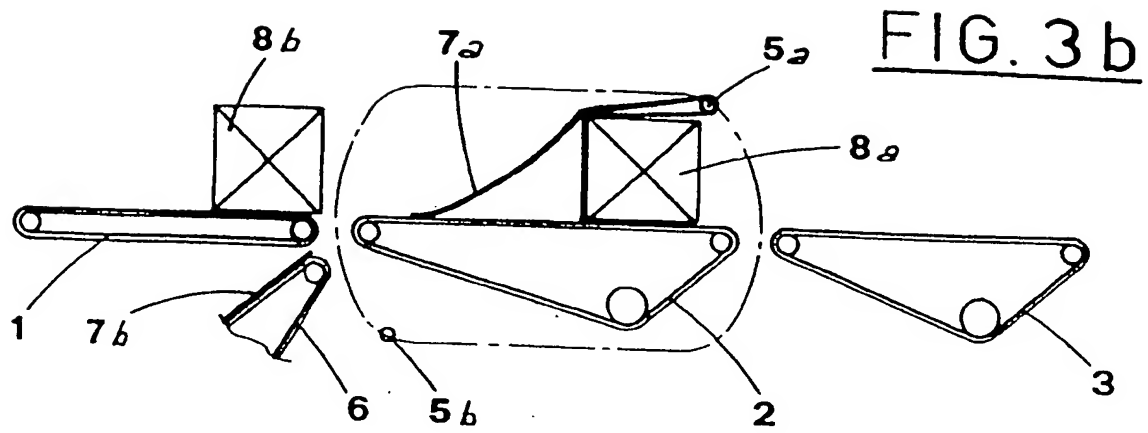
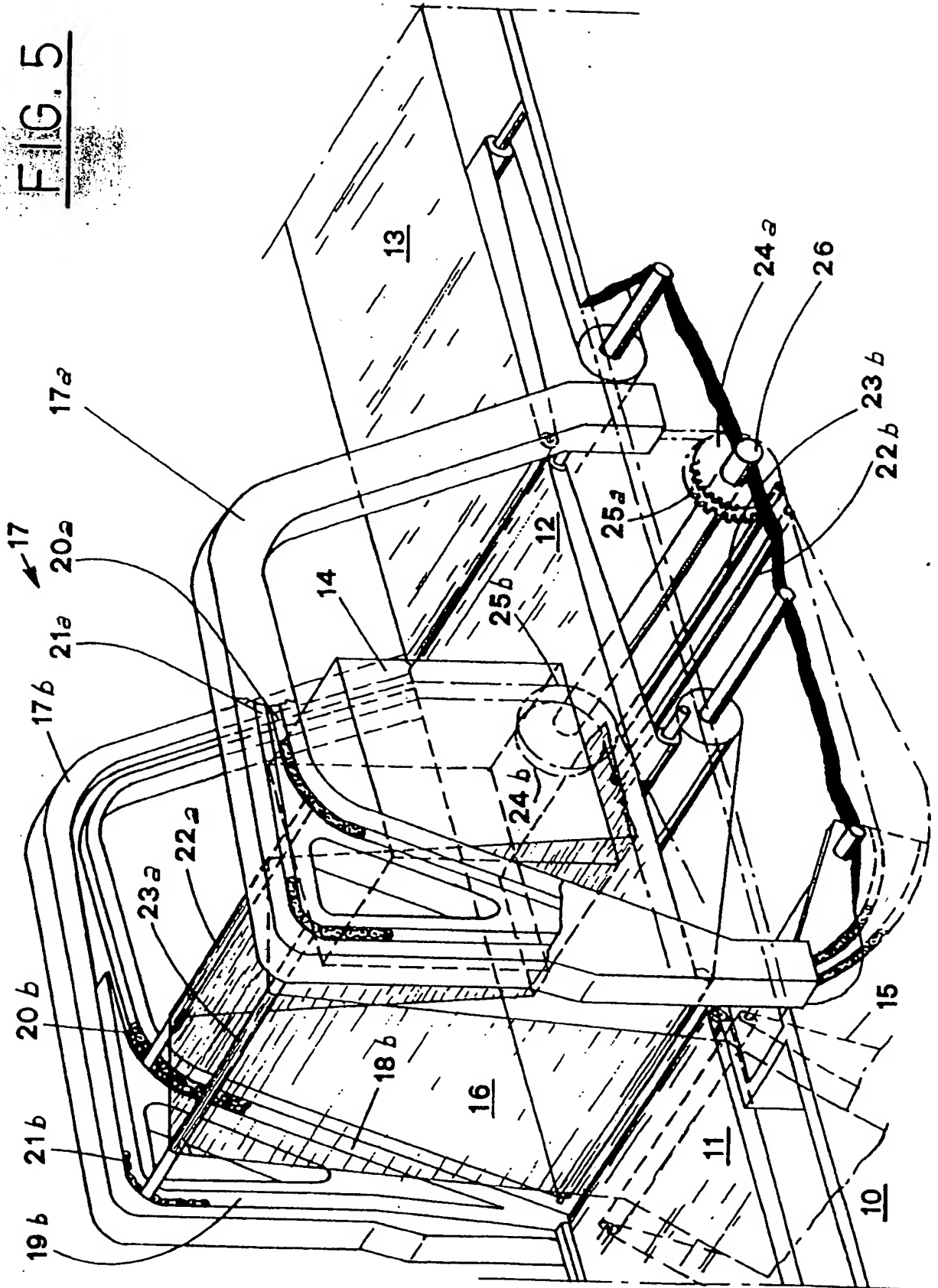
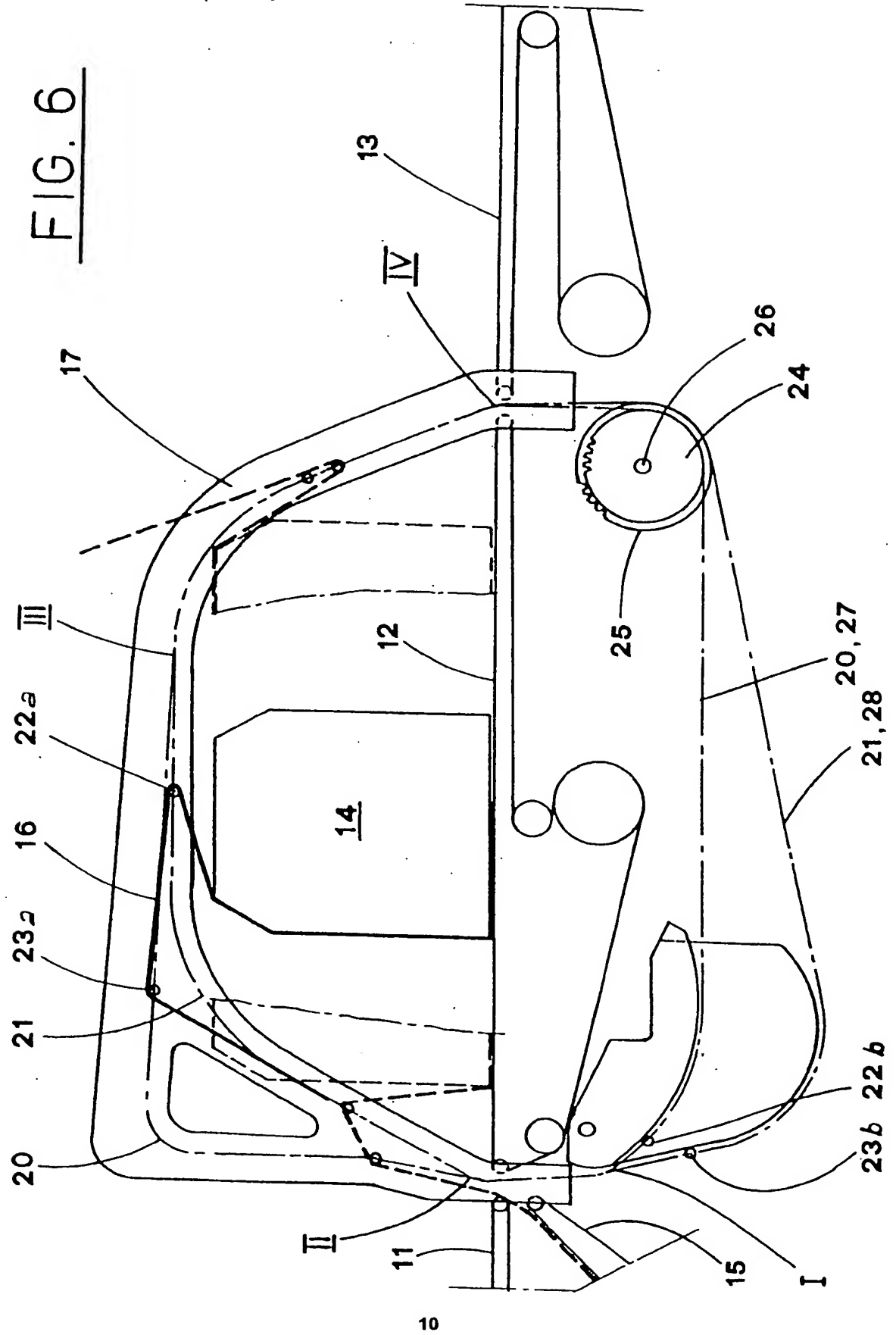
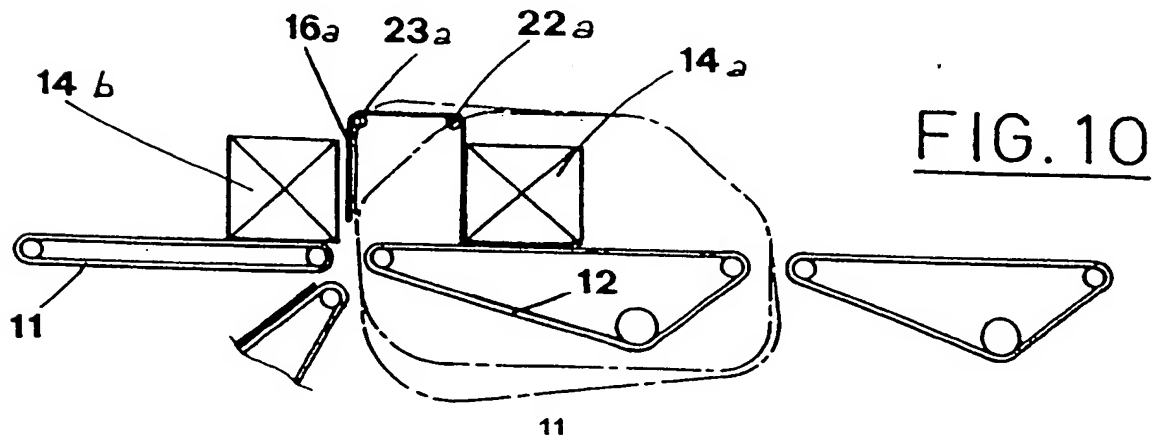
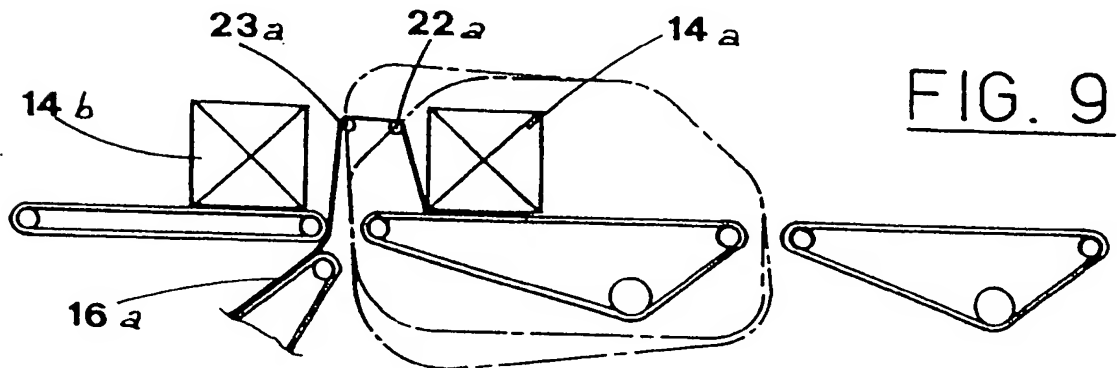
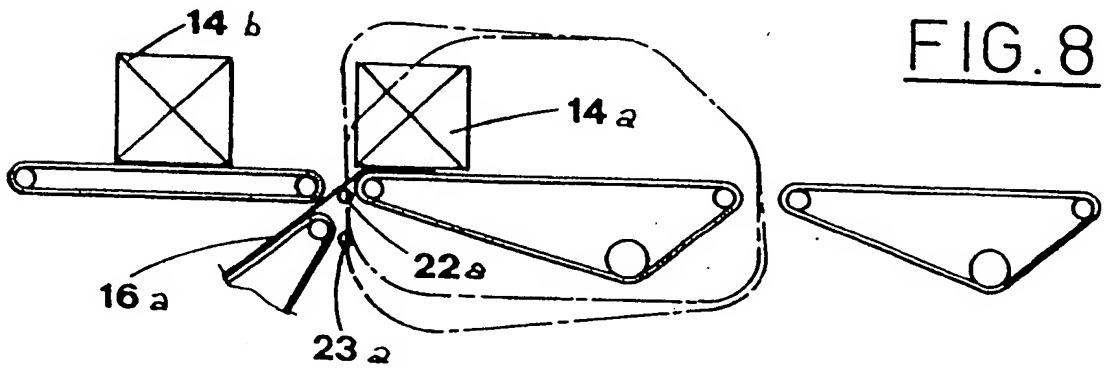
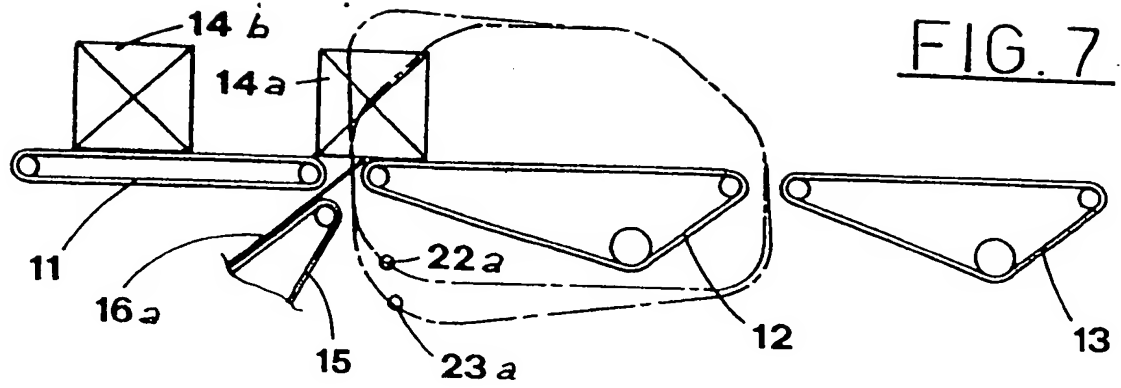




FIG. 5







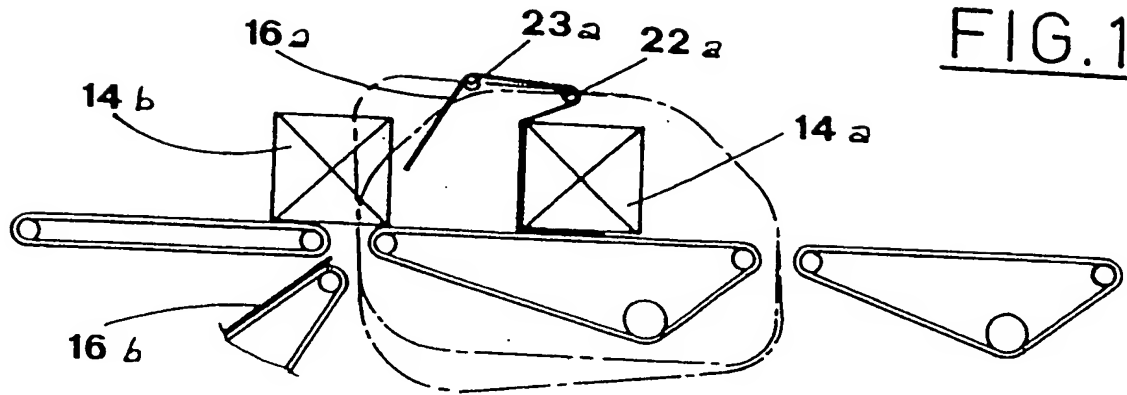


FIG. 11

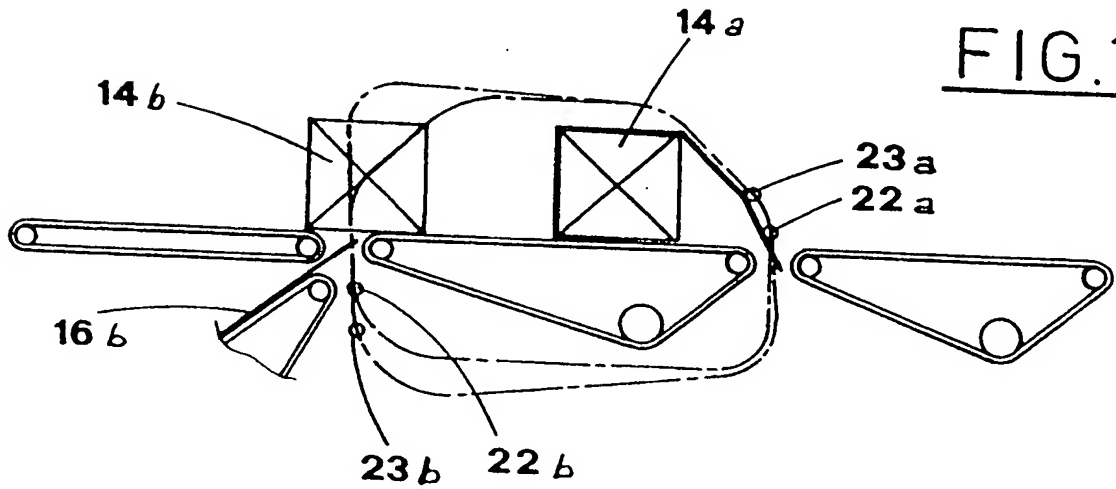


FIG. 12

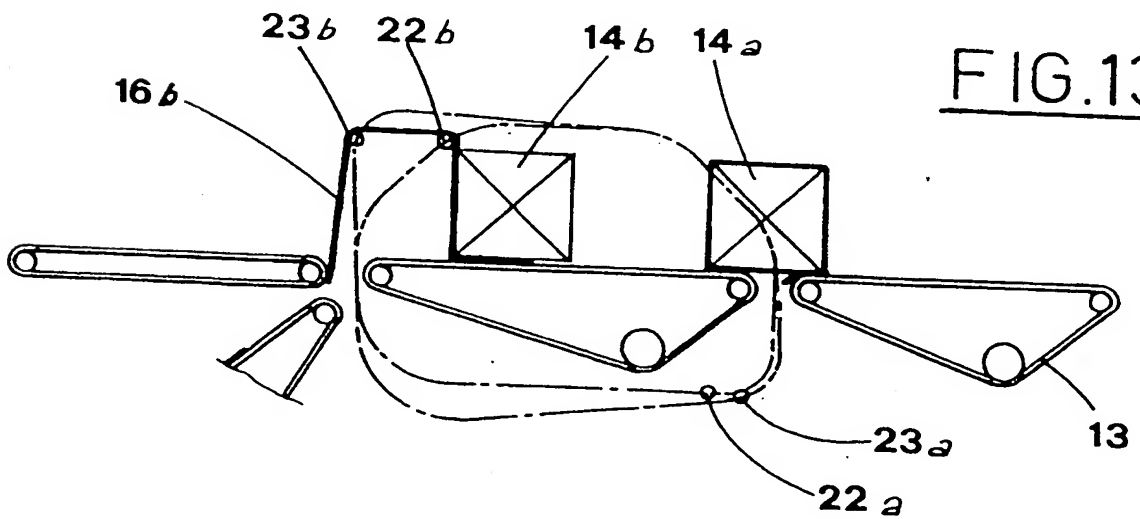


FIG. 13

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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 83 0290

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 229 452 (MEAD CORPORATION) * page 4, line 1 - page 8, line 39; figures *	1,2,4,6	B65B11/10
X	EP-A-0 049 377 (GANZ BROTHERS) * page 9, line 33 - page 11, line 12 * * page 12, line 20 - page 15, line 9; figures *	1,2,4,6	
A	DE-A-19 18 037 (WELDOTRON) * page 4, line 13 - page 5, line 22; figures *	1,6	
A	US-A-4 663 914 (R. GANZ)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 September 1994	Examiner Jagusiak, A
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